

RTCA Special Committee 186, Working Group 3

ADS-B 1090 MOPS

Meeting #2

Supporting Action Item 1-2:

Extension of Coast Time for Global Decode from 25 to 120 Seconds

Presented by Vince Orlando

| SUMMARY |
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| <p>At the first 1090 Rev A WG-3 meeting, it was agreed to change the coast time for a Global CPR Decode from 25 to 120 seconds, subject to the presentation of technical proof that such a change did not cause any global decode ambiguity problems.</p> <p>This Working Paper presents the changes to DO-260 needed to make this change. The technical analysis presentation will be provided by Ian Levitt in Working Paper 1090-WP-2-01.</p> |

1. Background

A change to the coast time for a global decode from 25 to 120 seconds was approved at the first meeting of 1090 MHz MOPS Revision A, Working Group #3 meeting. This change was requested since data from the Frankfurt measurements indicated that it would provide a significant improvement in track continuity for long-range targets.

2. CPR Decoding

WG-3 approval for this change was contingent upon the presentation of material that showed that there would be no ambiguity problems with CPR decoding with the longer coast time, especially in the polar region.

Technical material in support of the 120 second decoding will be presented by Ian Levitt in 1090 Working Paper 2-01.

3. Proposed Changes

Bob Saffell and Ian Levitt identified changes to the 1090 MHz MOPS, RTCA/DO-260, to accomplish a coast time of 120 seconds at the first meeting of 1090 WG-3. The changes are contained in the attachment to this Working Paper and include changes to the following material in DO-260.

Section 2.2.10.3

Section 2.4.10.3

Figure 2-16B

Figure 2-16C

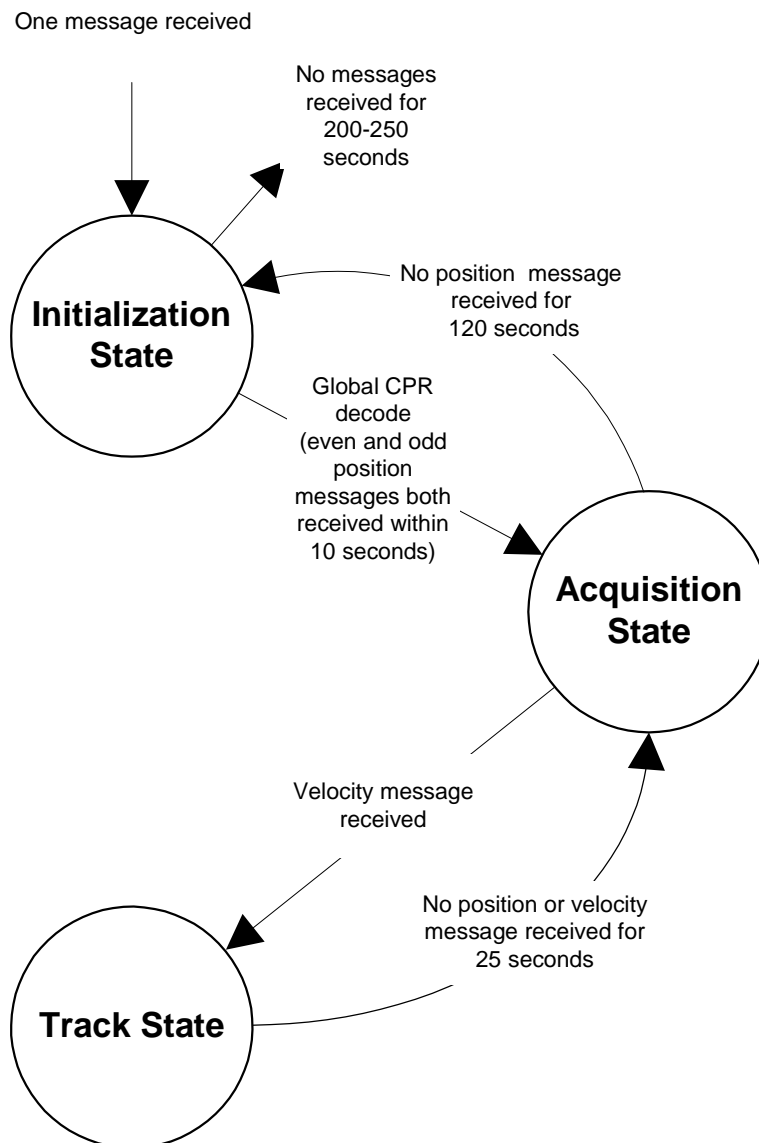


Figure 2-16b: Report Assembly State Transition Diagram.

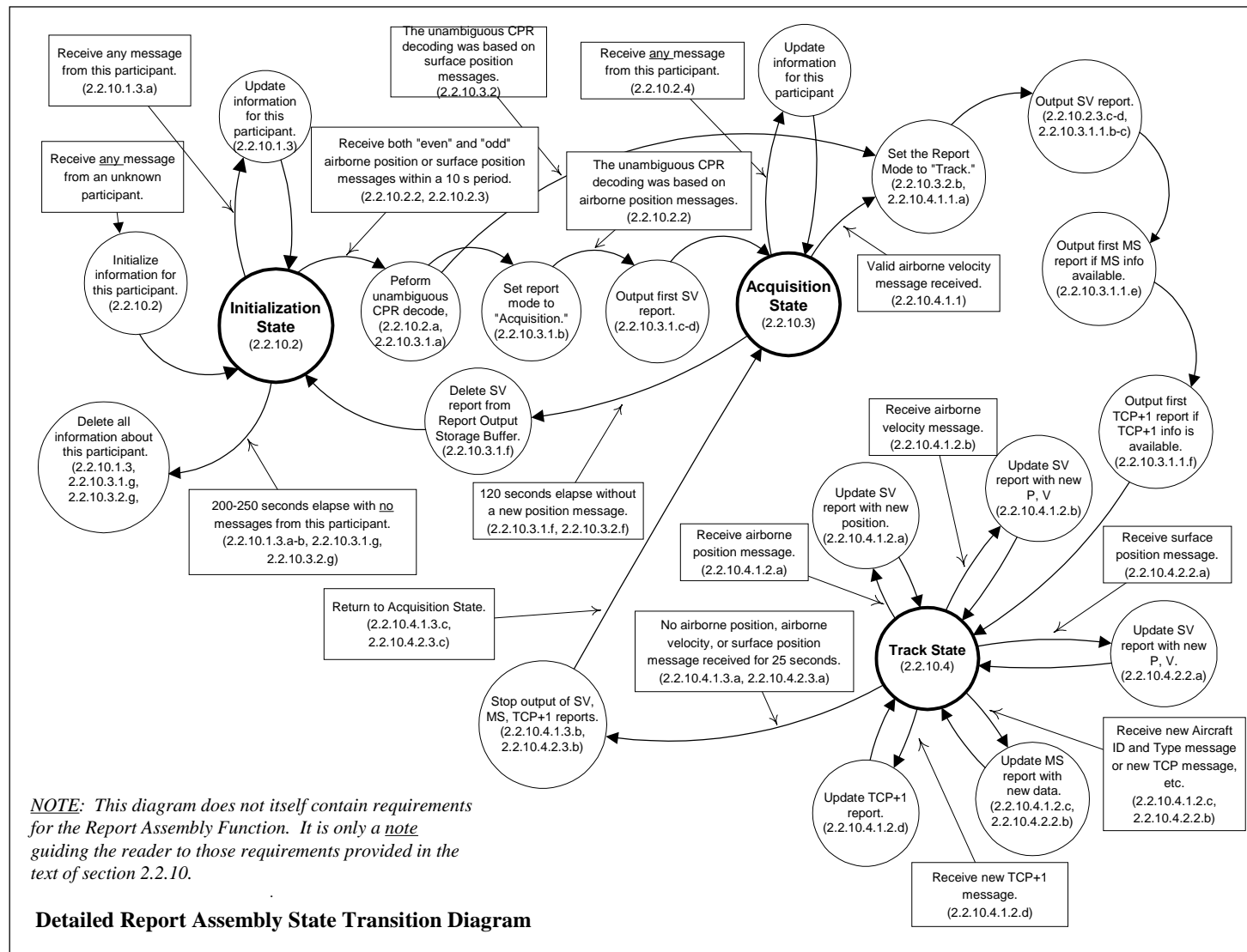


Figure 2-16c: Detailed Report Assembly State Transition Diagram

2.2.10.1.2 ADS-B Report Organization

- a. All ADS-B message receptions and Reports shall be organized (i.e., indexed) in accordance with the Participant Address that is transmitted in the “AA” Address Field of all ADS-B transmitted messages (see section 2.2.3.2.1.1.1).
- b. The Participant Address shall be a mandatory element in all ADS-B Reports (see Table 2-64 Item 1, Table 2-70 Item 1, and Table 2-73 Item 1).

2.2.10.1.3 ADS-B Message Temporary Retention

- a. Unless otherwise specified, all ADS-B Messages and decoded latitude and longitude values received for a given Participant Address shall be appropriately time tagged and temporarily stored for at least 200 seconds unless replaced by a received message of equivalent type.

Note: *This requirement is intended to aid in the start-up of Report Assembly for a given Participant such that as much data as possible can be provided as soon as a Track is initialized on the given participant.*

- b. If no new messages have been received from a given Participant for 250 seconds, then all records (including temporary storage) relevant to the Participant Address shall be deleted from temporary storage and from the Report Output Storage Buffer.

2.2.10.1.4 Participant ADS-B Track Files

A Track File is defined as the accumulation of reports maintained on a given participant. In the ADS-B case, the Track File refers to the State Vector, Mode Status, and TCP+1 Reports, which comprise a set of reports maintained on a given participant.

The ADS-B Report Assembly function shall maintain one, and only one, Track File, i.e., set of reports on any given participant.

2.2.10.2 Report Assembly Initialization State

The Initialization State is entered for any given Participant for which there is no information upon receipt of any of the following ADS-B messages received from the given Participant:

- a. Airborne Position Message (i.e., a State Vector Position Message --- Airborne) (see section 2.2.3.2.3)
- b. Surface Position Message (i.e., a State Vector Position Message --- Surface) (see section 2.2.3.2.4)
- c. ADS-B Aircraft Identification and Type Message (see section 2.2.3.2.5)
- d. ADS-B Airborne Velocity Information Message (see section 2.2.3.2.6)
- e. “Aircraft” Trajectory Intent Message (see section 2.2.3.2.7.1)

- f. “Aircraft” Operational Coordination Message (see section 2.2.3.2.7.2)
- g. “Aircraft” Operational Status Message (see section 2.2.3.2.7.3)

2.2.10.3 Report Assembly Acquisition State

2.2.10.3.1 Report Assembly Acquisition State --- Airborne Participant

Upon receipt of an “*even*” and an “*odd*” encoded Airborne Position Message from a given Participant within a ten second period, the Report Assembly Function shall:

- a. Perform a successful Globally Unambiguous CPR decode of the Participant Position in accordance with section A.7.7 of Appendix A,
- b. Set the Report Mode to “Acquisition” for the given Airborne Participant in the State Vector Report (see section 2.2.8.1) in accordance with section 2.2.8.1.28,
- c. Structure all possible fields of the State Vector Report for the given Airborne Participant in accordance with section 2.2.8.1 (all subsections inclusive),
- d. Deliver the first structured State Vector Report for the given Airborne Participant to the Report Output Storage Buffer for subsequent access by the Application Interface on demand,
- e. Continue to maintain the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for at least 200 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections, the conditions of the following subparagraphs shall apply:
- f. If a new Position Message is not received within a ~~25-120~~ second period, then the Globally Unambiguous CPR decode performed in step a. shall be considered to be invalid, and the Report Assembly Function shall return to the Initialization State. (In order to proceed to the Track State for the airborne participant, the Globally Unambiguous CPR decode will need to be repeated.)

Note: *This action effectively represents a return to the Initialization State with the exception that the return is to step a. above, and the report is retained as per step e. The purpose of this action is to minimize the need to perform the Globally Unambiguous CPR decode since it is not necessary when position messages have been received within the reasonable time limit of ~~25-120~~ seconds. This action is illustrated in Figure 2-16b.*

- g. If no new messages have been received from a given Airborne Participant for at least 200 seconds, then all reports relevant to the Participant Address shall be deleted from the Report Output Storage Buffer.

2.2.10.3.1.1 Latency, Report Assembly Acquisition State --- Airborne Participant

Step 2.2.10.3.1d shall be completed within 500 milliseconds of receipt of the second Airborne Position Message of the “*even*” and “*odd*” pair.

2.2.10.3.2 Report Assembly Acquisition State --- Surface Participant

Upon receipt of an “*even*” and an “*odd*” encoded Surface Position Message from a given Participant within a ten second period, the Report Assembly Function shall:

- a. Perform a successful Local Unambiguous CPR decode of the Participant Position in accordance with section A.7.6 of Appendix A,
- b. Set the Report Mode to “Track” for the given Surface Participant in the State Vector Report (see section 2.2.8.1) in accordance with section 2.2.8.1.28,
- c. Structure all possible fields of the State Vector Report for the given Surface Participant in accordance with section 2.2.8.1 (all subsections inclusive),
- d. Deliver the first structured State Vector Report for the given Surface Participant to the Report Output Storage Buffer for subsequent access by the Application Interface on demand,
- e. Continue to maintain the integrity of the State Vector Report for the given Surface Participant in the Report Output Storage Buffer for at least 200 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections, and the conditions of the following subparagraphs shall apply:
- f. If a new Position Message is not received within a ~~25-120~~ second period, then the Local Unambiguous CPR decode performed in step a. shall be considered to be invalid, and the Report Assembly Function shall return to the Initialization State. In order to proceed from the Acquisition State to the Track State, the Local Unambiguous CPR decode must be repeated.

Note: *This action effectively represents a return to the Initialization State with the exception that the return is to step a. above, and the report is retained as per step e. The purpose of this action is to minimize the need to perform the Local Unambiguous CPR decode since it is not necessary when position messages have been received within the reasonable time limit of ~~25-120~~ seconds. This action is illustrated in Figure 2-16b.*

- g. If no new messages have been received from a given Surface Participant for at least 200 seconds, then all reports relevant to the Participant Address shall be deleted from the Report Output Storage Buffer.

2.2.10.3.2.1 Latency, Report Assembly Acquisition State --- Surface Participant

Step 2.2.10.3.2.d shall be completed within 500 milliseconds of receipt of the second Surface Position Message of the “*even*” and “*odd*” pair.

2.2.10.3.3 Acquisition State Data Retention

Upon receipt of any of the messages identified in section 2.2.10.2 for any given participant, the received message shall either:

- a. Use the message as required in section 2.2.10.3.1 for Airborne Participants or section 2.2.10.3.2 for Surface Participants, or

- b. Retain the message for future use as specified in section 2.2.10.1.3.

2.2.10.4 Report Assembly Track State

2.2.10.4.1 Report Assembly Track State --- Airborne Participant

2.2.10.4.1.1 Report Assembly Track State Initialization --- Airborne Participant

Initialization of the Track State for a given Airborne Participant assumes that the Acquisition State has been established for the given Participant in accordance with section 2.2.10.2.2.

Upon receipt of a valid Airborne Velocity Information Message (see section 2.2.3.2.6) for a given Airborne Participant, the Report Assembly Function shall:

- a. Set the Report Mode to “Track” for the given Airborne Participant in the State Vector Report (see section 2.2.8.1) in accordance with section 2.2.8.1.28,
- b. Structure all possible fields of the State Vector Report for the given Airborne Participant in accordance with section 2.2.8.1 (all subsections inclusive),
- c. Deliver the new State Vector Report for the given Airborne Participant to the Report Output Storage Buffer within 500 milliseconds of receipt of the Airborne Velocity Information Message,
- d. Maintain the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections,
- e. Initiate Assembly of Mode Status Reports:
 - (1). The Report Assembly Function shall review all messages received from the given Airborne Participant that may have been placed in temporary storage in accordance with section 2.2.10.1.3.
 - (2). Upon completion of the message review, the Report Assembly Function shall structure all possible fields of the Mode Status Report for the given Airborne Participant in accordance with section 2.2.8.2 (all subsections inclusive).
 - (3). The Report Assembly Function shall deliver the new Mode Status Report for the given Airborne Participant to the Report Output Storage Buffer within 500 milliseconds of receipt of the Airborne Velocity Information Message which initialized the Track State.
 - (4). The Report Assembly Function shall maintain the integrity of the Mode Status Report for the given Airborne Participant in the Report Output Storage Buffer 100 +/- 5 seconds unless replaced by an updated Mode Status Report or otherwise specified in the following sections.

f. Initiate Assembly of ADS-B TCP + 1 Reports:

- (1). The Report Assembly Function shall review all messages received from the given Airborne Participant that may have been placed in temporary storage in accordance with section 2.2.10.1.3.
- (2). Upon completion of the message review, the Report Assembly Function shall structure all possible fields of the ADS-B TCP + 1 Report for the given Airborne Participant in accordance with section 2.2.8.3 (all subsections inclusive).
- (3). The Report Assembly Function shall deliver the new ADS-B TCP + 1 Report for the given Airborne Participant to the Report Output Storage Buffer within 500 milliseconds of receipt of the Airborne Velocity Information Message which initialized the Track State.
- (4). The Report Assembly Function shall maintain the integrity of the ADS-B TCP + 1 Report for the given Airborne Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated ADS-B TCP + 1 Report or otherwise specified in the following sections.

2.2.10.4.1.2 Report Assembly Track State Maintenance --- Airborne Participant

The Track State shall be maintained for a given Airborne Participant for as long as Airborne Position Messages (see section 2.2.3.2.3) and Airborne Velocity Information Messages (see section 2.2.3.2.6) are being received from the Participant.

- a. Each time that a new Airborne Position Message is received from the given Airborne Participant, the Report Assembly Function shall:
 - (1). Perform a CPR decode of the Participant Position in accordance with section A.7.4 and A.7.5 of Appendix A,
 - (2). Update all possible fields of the State Vector Report for the given Airborne Participant in accordance with section 2.2.8.1 (all subsections inclusive),
 - (3). Deliver the updated State Vector Report to the Report Output Storage Buffer within 500 milliseconds of receipt of the new Airborne Position Message, and
 - (4). Maintain the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections.
- b. Each time that a new Airborne Velocity Information Message is received from the Airborne Participant, the Report Assembly Function shall:
 - (1). Update all possible fields of the State Vector Report for the given Airborne Participant in accordance with section 2.2.8.1 (all subsections inclusive),
 - (2). Deliver the updated State Vector Report to the Report Output Storage Buffer within 500 milliseconds of receipt of the new Airborne Position Message, and

- (3). Maintain the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections.
- c. Each time that a new Aircraft Identification and Type Message (see section 2.2.3.2.5), Aircraft Trajectory Intent Message (see section 2.2.3.2.7.1) having TCP information, Aircraft Operational Coordination Message (see section 2.2.3.2.7.2), Aircraft Operational Status Message (see section 2.2.3.2.7.3), or Aircraft Status Message (see section 2.2.3.2.7.9) is received from the Airborne Participant, the Report Assembly Function shall:
 - (1). Update all possible fields of the Mode Status Report for the given Airborne Participant in accordance with section 2.2.8.2 (all subsections inclusive),
 - (2). Deliver the updated Mode Status Report to the Report Output Storage Buffer within 500 milliseconds of receipt of the new Message, and
 - (3). Maintain the integrity of the Mode Status Report for the given Airborne Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated Mode Status Report or otherwise specified in the following sections.
 - d. Each time that a new Aircraft Trajectory Intent Message (see section 2.2.3.2.7.1) having TCP + 1 information is received from the given Airborne Participant, the Report Assembly Function shall:
 - (1). Update all possible fields of the ADS-B TCP + 1 Report for the given Airborne Participant in accordance with section 2.2.8.3 (all subsections inclusive),
 - (2). Deliver the updated ADS-B TCP + 1 Report to the Report Output Storage Buffer within 500 milliseconds of receipt of the new Message, and
 - (3). Maintain the integrity of the ADS-B TCP + 1 Report for the given Airborne Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated ADS-B TCP + 1 Report or otherwise specified in the following sections.

2.2.10.4.1.3 Report Assembly Track State Termination --- Airborne Participant

- a. The Track State shall be terminated for a given Airborne Participant if no Airborne Position (see section 2.2.3.2.3) or Airborne Velocity Information (see section 2.2.3.2.6) Messages have been received from the Participant in 25 +/- 5 seconds.
- b. Upon termination of the Track State for a given Airborne Participant, the Report Assembly Function shall immediately delete all State Vector, Mode Status, and ADS-B TCP + 1 Reports that were placed in the Report Output Storage Buffer for the given Participant.

Note: *The track state termination requires deletion of all reports structured for a given participant into the Report Output Storage Buffer. Track state termination does not intend that temporary storage (see section 2.2.10.1.3)*

established for the given Participant be deleted. The temporary storage is only deleted if NO ADS-B messages have been received from the given Participant for 225 +/- 25 seconds.

- c. Upon completion of the preceding step b., the Report Assembly Function shall return to the Report Assembly Acquisition State for the given Airborne Participant as specified in section 2.2.10.~~2.23.1~~.

2.2.10.4.2 Report Assembly Track State --- Surface Participant

2.2.10.4.2.1 Report Assembly Track State Initialization --- Surface Participant

Initialization of the Track State for a given Surface Participant is established in accordance with section 2.2.10.3.2.

In addition to the requirements specified in section 2.2.10.3.2, the Report Assembly Function shall initiate assembly of Mode Status Reports as follows:

- a. The Report Assembly Function shall review all messages received from the given Surface Participant that may have been placed in temporary storage in accordance with section 2.2.10.1.3.
- b. Upon completion of the message review, the Report Assembly Function shall structure all possible fields of the Mode Status Report for the given Surface Participant in accordance with section 2.2.8.2 (all subsections inclusive).
- c. The Report Assembly Function shall deliver the new Mode Status Report for the given Surface Participant to the Report Output Storage Buffer within 500 milliseconds of receipt of the last received Surface Position Message which initialized the Track State.
- d. The Report Assembly Function shall maintain the integrity of the Mode Status Report for the given Surface Participant in the Report Output Storage Buffer 100 +/- 5 seconds unless replaced by an updated Mode Status Report or otherwise specified in the following sections.

2.2.10.4.2.2 Report Assembly Track State Maintenance --- Surface Participant

The Track State shall be maintained for a given Surface Participant for as long as Surface Position Messages (see section 2.2.3.2.4) are being received from the Surface Participant.

- a. Each time that a new Surface Position Message is received from the given Surface Participant, the Report Assembly Function shall:
 - (1). Perform a CPR decode of the Participant Position in accordance with section A.7.4 and A.7.6 of Appendix A,
 - (2). Update all possible fields of the State Vector Report for the given Surface Participant in accordance with section 2.2.8.1 (all subsections inclusive),

- (3). Deliver the updated State Vector Report to the Report Output Storage Buffer within 500 milliseconds of receipt of the new Surface Position Message, and
 - (4). Maintain the integrity of the State Vector Report for the given Surface Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections.
- b. Each time that a new Aircraft Identification and Type Message (see section 2.2.3.2.5), Aircraft Operational Coordination Message (see section 2.2.3.2.7.2), Aircraft Operational Status Message (see section 2.2.3.2.7.3), or Aircraft Status Message (see section 2.2.3.2.7.9) is received from the Surface Participant, the Report Assembly Function shall:
- (1). Update all possible fields of the Mode Status Report for the given Surface Participant in accordance with section 2.2.8.2 (all subsections inclusive),
 - (2). Deliver the updated Mode Status Report to the Report Output Storage Buffer within 500 milliseconds of receipt of the new Message, and
 - (3). Maintain the integrity of the Mode Status Report for the given Surface Participant in the Report Output Storage Buffer for 100 +/- 5 seconds unless replaced by an updated Mode Status Report or otherwise specified in the following sections.

2.2.10.4.2.3 Report Assembly Track State Termination --- Surface Participant

- a. The Track State shall be terminated for a given Surface Participant if no Surface Position Message (see section 2.2.3.2.4) has been received from the Participant in 25 +/- 5 seconds.
- b. Upon termination of the Track State for a given Surface Participant, the Report Assembly Function shall immediately delete all State Vector and Mode Status Reports that were placed in the Report Output Storage Buffer for the given Participant.

Notes:

1. *The track state termination requires deletion of all reports structured into the Report Output Storage Buffer. Track state termination does not intend that temporary storage (see section 2.2.10.1.3) established for the given Participant be deleted. The temporary storage is only deleted if NO ADS-B messages have been received from the given Participant for 225 +/- 25 seconds.*
 2. *ADS-B Surface Participants do not generate TCP nor TCP information; therefore, ADS-B TCP + 1 Report assembly is not required for Surface Participants.*
- c. Upon completion of the preceding step b., the Report Assembly Function shall return to the Report Assembly Acquisition State for the given Surface Participant as specified in section 2.2.10.2.3.2.

2.4.10.2 Verification of the Report Assembly Initialization State (subparagraph 2.2.10.2)

Appropriate test procedures for verifying that the Report Assembly Function correctly enters the “Initialization State” are provided in subparagraph 2.4.10.1.3.

2.4.10.3 Verification of the Report Assembly Acquisition State (subparagraph 2.2.10.3)

No specific test procedure is required to validate subparagraph 2.2.10.3

2.4.10.3.1 Verification of the Report Assembly Acquisition State --- Airborne Participant (subparagraph 2.2.10.3.1)

Purpose/Introduction

Upon receipt of an “*even*” and an “*odd*” encoded Airborne Position Message from a given Participant within a ten second period, the Report Assembly Function shall:

- a. Perform a successful Globally Unambiguous CPR decode of the Participant Position in accordance with section A.7.7 of Appendix A,
- b. Set the Report Mode to “Acquisition” for the given Airborne Participant in the State Vector Report (see section 2.2.8.1) in accordance with section 2.2.8.1.28,
- c. Structure all possible fields of the State Vector Report for the given Airborne Participant in accordance with section 2.2.8.1 (all subsections inclusive),
- d. Deliver the first structured State Vector Report for the given Airborne Participant to the Report Output Storage Buffer for subsequent access by the Application Interface on demand,
- e. Continue to maintain the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for at least 200 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections, the conditions of the following subparagraphs shall apply:
- f. If a new Position Message is not received within a ~~25-120~~ second period, then the Globally Unambiguous CPR decode performed in step a. shall be considered to be invalid, and the Report Assembly Function shall return to the Initialization State. (In order to proceed to the Track State for this Airborne Participant, the Globally Unambiguous CPR decode will need to be repeated.)

Note: *This action effectively represents a return to the Initialization State with the exception that the return is to step a. above, and the report is retained as per step e. The purpose of this action is to minimize the need to perform the Globally Unambiguous CPR decode since it is not necessary when position messages have been received within the reasonable time limit of ~~25-120~~ seconds. This action is illustrated in Figure 2-16b.*

- g. If no new messages have been received from a given Airborne Participant for at least 200 seconds, then all reports relevant to the Participant Address shall be deleted from the Report Output Storage Buffer.

Measurement Procedure:

Step 1: Globally Unambiguous CPR Decode

It is not the purpose of this Test procedure to re-test the individual elements of this requirement such as Globally Unambiguous CPR Decode and State Vector Report generation. These elements are tested elsewhere in these procedures.

Therefore, using the Airborne scenario and simulation set up in Step 1 of subparagraph 2.4.10.1.3 above, verify that for each Participant for which an “**even**” and an “**odd**” pair of encoded Airborne Position Messages is received within a ten (10) second period that the Report Assembly Function correctly performs a successful Globally Unambiguous CPR Decode in accordance with Section A.7.7 of Appendix A.

Step 2: Report Mode set to Acquisition

Verify that for each Participant in the Airborne scenario and simulation set up in Step 1 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Airborne Position Message was received within a ten (10) second period that the Report Assembly Function correctly sets the Report Mode to “Acquisition” in the State Vector Report in accordance with the formatting specified in subparagraph 2.2.8.1.28.

Step 3: State Vector Report Creation

Verify that for each Participant in the Airborne scenario and simulation set up in Step 1 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Airborne Position Message was received within a ten (10) second period that the Report Assembly Function correctly structures all possible fields of the State Vector Report for the given Airborne Participant in accordance with subparagraph 2.2.8.1 (all subsections inclusive).

Step 4: Report Output Storage Buffer Initialization

Verify that for each Participant in the Airborne scenario and simulation set up in Step 1 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Airborne Position Message was received within a ten (10) second period that the Report Assembly Function correctly delivers the first structured State Vector Report for the given Airborne Participant to the Report Output Storage Buffer for subsequent access by the Application Interface, within 500 milliseconds of receipt of the second Airborne Position Message of the “**even**” and “**odd**” pair for the given Airborne Participant.

Step 5: Maintenance of Report Output Storage Buffer

Verify that for each Participant in the Airborne scenario and simulation set up in Step 1 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1

above that an “**even**” and an “**odd**” encoded Airborne Position Message was received within a ten (10) second period that the Report Assembly Function correctly maintains the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for at least 200 seconds unless:

- a. replaced by an updated State Vector Report, or
- b. no new messages have been received from a given Airborne Participant for a period of 100 +/- 5 seconds, in which case, verify that all reports relevant to the Airborne Participant Address have been deleted from the Report Output Storage Buffer.

Step 6: New Globally Unambiguous CPR Decode

Verify that for each Participant in the Airborne scenario and simulation set up in Step 1 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Airborne Position Message was received within a ten (10) second period that the Report Assembly Function correctly maintains the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for at least 200 seconds unless a new Airborne Position Message is received within a ~~25-120~~ second period for the given Airborne Participant.

Verify that when a new Airborne Position Message is received for a given Airborne Participant within a ~~25-120~~ second period, that the Report Assembly Function performs a new Globally Unambiguous CPR Decode as specified in Step 1 above and verify that the new information is correctly updated in the State Vector Report and the Report Output Storage Buffer for the given Airborne Participant.

Verify that when no new Airborne Position Message is received for a given Airborne Participant within a ~~25-120~~ second period, that the Report Assembly Function correctly sets the Report Mode to “Initialization” (No Report Generation Capability mode) in the State Vector Report in accordance with the formatting in subparagraph 2.2.8.1.28.

Step 7: Purge Participant from the Report Output Storage Buffer

Verify that for each Participant in the Airborne scenario and simulation set up in Step 1 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Airborne Position Message was received within a ten (10) second period that the Report Assembly Function correctly maintains the integrity of the State Vector Report for the given Airborne Participant in the Report Output Storage Buffer for at least 200 seconds unless replaced by an updated State Vector Report for the given Airborne Participant

Verify that when no new Messages of any type have been received from a given Airborne Participant for at least 200 seconds, that the Report Assembly

Function correctly deletes all reports relevant to the given Airborne Participant Address from the Report Output Storage Buffer.

2.4.10.3.1.1 Verification of the Latency, Report Assembly Acquisition State --- Airborne Participant (subparagraph 2.2.10.3.1.1)

Purpose/Introduction:

Step “d” in subparagraph 2.2.10.3.1 shall be completed within 500 milliseconds of receipt of the second Airborne Position Message of the “**even**” and “**odd**” pair.

Measurement Procedure:

Appropriate test procedures for the verification of this requirement are provided in subparagraph 2.4.10.3.1, Step 4.

2.4.10.3.2 Verification of the Report Assembly Acquisition State --- Surface Participant (subparagraph 2.2.10.3.2)

Purpose/Introduction

Upon receipt of an “**even**” and an “**odd**” encoded Surface Position Message from a given Participant within a ten second period, the Report Assembly Function shall:

- a. Perform a successful Locally Unambiguous CPR decode of the Participant Position in accordance with section A.7.6 of Appendix A,
- b. Set the Report Mode to “Track” for the given Surface Participant in the State Vector Report (see section 2.2.8.1) in accordance with section 2.2.8.1.28,
- c. Structure all possible fields of the State Vector Report for the given Surface Participant in accordance with section 2.2.8.1 (all subsections inclusive),
- d. Deliver the first structured State Vector Report for the given Surface Participant to the Report Output Storage Buffer for subsequent access by the Application Interface on demand,
- e. Continue to maintain the integrity of the State Vector Report for the given Surface Participant in the Report Output Storage Buffer for at least 200 seconds unless replaced by an updated State Vector Report or otherwise specified in the following sections, and the conditions of the following subparagraphs shall apply:
- f. If a new Position Message is not received within a ~~25~~120 second period, then the Locally Unambiguous CPR decode performed in step a. shall be considered to be invalid. In order to proceed from the Acquisition State to the Track State, the Locally Unambiguous CPR decode must be repeated.

Note: *This action effectively represents a return to the Initialization State with the exception that the return is to step a. above, and the report is retained as per step e. The purpose of this action is to minimize the need to perform the*

Locally Unambiguous CPR decode since it is not necessary when position messages have been received within the reasonable time limit of ~~25~~120 seconds. This action is illustrated in Figure 2-16b.

- g. If no new messages have been received from a given Surface Participant for at least 200 seconds, then all reports relevant to the Participant Address shall be deleted from the Report Output Storage Buffer.

Measurement Procedure:

Step 1: Locally Unambiguous CPR Decode

It is not the purpose of this Test procedure to re-test the individual elements of this requirement such as Locally Unambiguous CPR Decode and State Vector Report generation. These elements are tested elsewhere in these procedures.

Therefore, using the Surface scenario and simulation set up in Step 2 of subparagraph 2.4.10.1.3 above, verify that for each Participant for which an “**even**” and an “**odd**” pair of encoded Surface Position Messages is received within a ten (10) second period that the Report Assembly Function correctly performs a successful Locally Unambiguous CPR Decode in accordance with Section A.7.6 of Appendix A.

Step 2: Report Mode set to Track

Verify that for each Participant in the Surface scenario and simulation set up in Step 2 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Surface Position Message was received within a ten (10) second period that the Report Assembly Function correctly sets the Report Mode to “Track” in the State Vector Report in accordance with the formatting specified in subparagraph 2.2.8.1.28.

Step 3: State Vector Report Creation

Verify that for each Participant in the Surface scenario and simulation set up in Step 2 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Surface Position Message was received within a ten (10) second period that the Report Assembly Function correctly structures all possible fields of the State Vector Report for the given Surface Participant in accordance with subparagraph 2.2.8.1 (all subsections inclusive).

Step 4: Report Output Storage Buffer Initialization

Verify that for each Participant in the Surface scenario and simulation set up in Step 2 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “**even**” and an “**odd**” encoded Airborne Position Message was received within a ten (10) second period that the Report Assembly Function correctly delivers the first structured State Vector Report for the given Surface Participant to the Report Output Storage Buffer for subsequent access by the

Application Interface, within 500 milliseconds of receipt of the second Surface Position Message of the “even” and “odd” pair for the given Surface Participant.

Step 5: Maintenance of Report Output Storage Buffer

Verify that for each Participant in the Surface scenario and simulation set up in Step 2 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “even” and an “odd” encoded Surface Position Message was received within a ten (10) second period that the Report Assembly Function correctly maintains the integrity of the State Vector Report for the given Surface Participant in the Report Output Storage Buffer for at least 200 seconds unless:

- a. Replaced by an updated State Vector Report, or
- b. No new messages have been received from a given Surface Participant for a period of 100 +/- 5 seconds, in which case, verify that all reports relevant to the Surface Participant Address have been deleted from the Report Output Storage Buffer.

Step 6: New Locally Unambiguous CPR Decode

Verify that for each Participant in the Surface scenario and simulation set up in Step 2 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “even” and an “odd” encoded Surface Position Message was received within a ten (10) second period that the Report Assembly Function correctly maintains the integrity of the State Vector Report for the given Surface Participant in the Report Output Storage Buffer for at least 200 seconds unless a new Surface Position Message is received within a ~~25-120~~ second period for the given Surface Participant.

Verify that when no new Surface Position Message is received for a given Surface Participant within a ~~25-120~~ second period, that the Report Assembly Function performs a new Locally Unambiguous CPR Decode as specified in Step 1 above and verify that the new information is correctly updated in the State Vector Report and the Report Output Storage Buffer for the given Surface Participant.

Step 7: Purge Participant from the Report Output Storage Buffer

Verify that for each Participant in the Surface scenario and simulation set up in Step 2 of subparagraph 2.4.10.1.3 above, where you have verified in Step 1 above that an “even” and an “odd” encoded Surface Position Message was received within a ten (10) second period that the Report Assembly Function correctly maintains the integrity of the State Vector Report for the given Surface Participant in the Report Output Storage Buffer for at least 200 seconds unless replaced by an updated State Vector Report for the given Surface Participant